Space Weather Forecast

Issued on Saturday, 12 February 2022 at 12:47 Local

This forecast provides a four-day assessment of space weather events. The probabilities stated below are for reaching or exceeding the given levels. For more information about space weather impacts please see the Met Office Space Weather Scales https://www.metoffice.gov.uk/weather/learn-about/space-weather/uk-scales

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Space Weather Forecast Headline: Minor R1 Radio Blackout observed. Slight Chance of Minor G1 Geomagnetic Storms.

Analysis of Space Weather Activity over past 24 hours

Solar Activity: Solar activity rose to moderate in the period, with a moderate-class X-ray flare observed from the vicinity of a new sunspot region at 12/0844UTC near the southwestern solar horizon. X-ray flares were otherwise modest in size, with a few low common-class events well-spread between the sunspot groups occupying the western horizon.

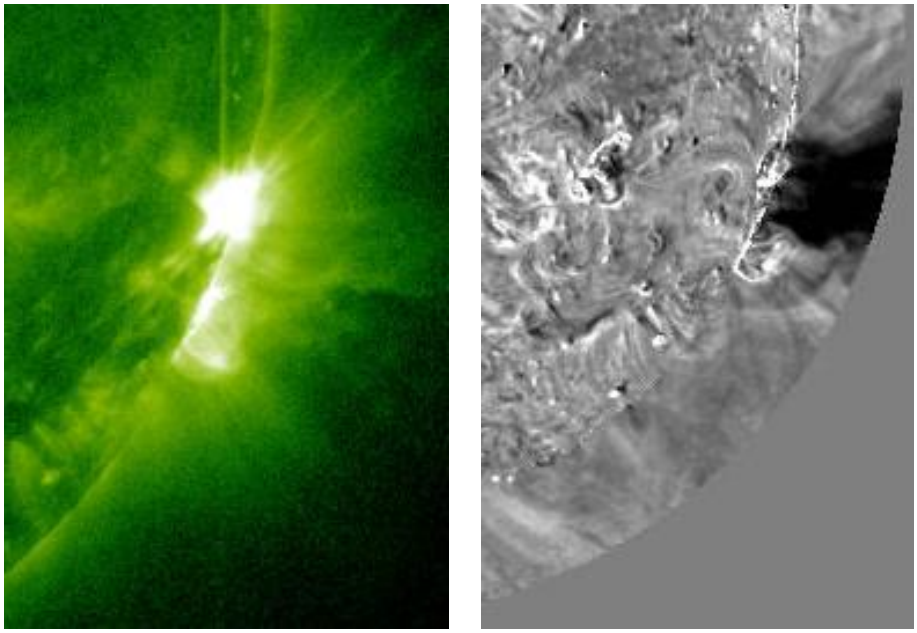

Figure 1: Left: False-colour extreme UV image of the moderate-class X-ray flare from the southwest of the sun at 12/0844UTC. Also shown (right) is an extreme UV signature of an emerging CME, known as a 'coronal dimming'.

There are currently four sunspots on the facing side of the sun, with two having recently disappeared from view. These groups include the largest on the disc - in the northwest, with slight growth in its intermediate spots the main trend observed. In the southwestern quarter of the sun, a pair of groups were visible, one of which was likely responsible for the moderate-class flare. The final of the four sunspots occupied the eastern solar hemisphere, with slight areal growth observed.

The past 24 hours have seen numerous apparently minor Coronal Mass Ejections (CMEs) on available satellite imagery. At the time of writing, none of these obviously have an Earth-directed component, appearing to emanate mostly in the rear-facing side of the sun. The moderate-class

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flare appears to have generated a CME from the southwest, and although this has yet to be fully analysed, an Earth-bound component from such a location appears unlikely. It remains to be seen whether any solar radiation storm results - the odds of this are rated at around 10% for S1. At present then, no confirmed Earth-directed Coronal Mass Ejections (CMEs) were in evidence, but confidence is lower than average. Should imagery appear that counters this assessment, then updates will follow.

Solar Wind / Geomagnetic Activity: Solar winds showed a transition from the tail of a CME that left the sun on the 06 February, ongoing since 09/2010UTC. This tail was strongly co-aligned with Earth's field to limit effects. A discontinuity in solar wind measures around 11/1800UTC then heralded the passing of this feature, before a coronal hole-like environment followed with a more typically small-scale and erratic magnetic field then observed.

The solar wind speed underwent a succession of rises to become elevated by the period's end. This was counter to the number of particles in the solar wind, which fell to typical background in the fast wind. As stated, the magnetic field associated with the particles saw a protracted spell co-aligned with Earth's field, and a lower magnetude and short-lived spell anti-aligned as the CME's influence faded.

The net result of the above solar wind measures peaked just below G1 Minor Geomagnetic Storm in the 18-21 and 21-24UTC intervals, otherwise being largely Quiet.

Energetic Particles / Solar Radiation: No solar radiation storms were observed, however some (likely minor) reaction in counts to the moderate-class X-ray flare is possible imminently.

Four-Day Space Weather Forecast Summary

Solar Activity: Solar activity is forecast to remain low through the next four days, but with a daily 20% chance of moderate-class X-ray flares. Sunspot regions are expected to be in a state of flux in the period, with numerous departures and arrivals, and confidence is therefore low.

Solar Wind / Geomagnetic Activity: No CMEs feature in this forecast period, although confidence in this is somewhat lower than usual owing to imagery gaps. The current fast wind ought to lead to peak geomagnetic activity for the four days, with a G1 most likely on day one, Saturday 12 February, declining into the new working week.

Energetic Particles / Solar Radiation: High energy proton flux is most likely to remain at background levels, but with a daily Slight Chance of S1. This risk peaks on day one given the moderate class X-ray flare observed this UTC morning, with a 10% risk of S1, otherwise falling to 5% and further still into the new week as the crowded western solar horizon depopulates.

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Geomagnetic Storms:

Geo-Magnetic Storm Probability (Exceedance)	Level	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC) (%)	Day 2 (00-24 UTC) (%)	Day 3 (00-24 UTC) (%)	Day 4 (00-24 UTC) (%)
Minor or Moderate	G1 to G2	No	20	5	1	1
Strong	G3	No	1	1	1	1
Severe	G4	No	1	1	1	1
Extreme	G5	No	1	1	1	1

Radio Blackouts - X Ray Flares:

X Ray Flares Probability	Level	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC) (%)	Day 2 (00-24 UTC) (%)	Day 3 (00-24 UTC) (%)	Day 4 (00-24 UTC) (%)
Active	R1-R2 M Class	No	20	20	20	20
Very Active	R3 to R5 X	No	2	2	2	2

Solar Radiation Storms - (High Energy Protons):

Radiation Storms Probability (Exceedance)	Level (cm^{-2} sr^{-1} s^{-1})	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC) (%)	Day 2 (00-24 UTC) (%)	Day 3 (00-24 UTC) (%)	Day 4 (00-24 UTC) (%)
Active	≥ S1	No	10	5	5	2
Very Active	≥ S3 *	No	1	1	1	1
* S3 ≥ 10 MeV ≥ 1000 pfu and / or ≥ 50 MeV ≥ 10 pfu. (pfu = $cm^{-2}sr^{-1}s^{-1}$)						

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